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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,414	12/21/2005	Nigel-Philip Cox	2002P17911WOUS	3588

28524 7590 03/16/2009

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EXAMINER	
VELASQUEZ, VANESSA T	
ART UNIT	**PAPER NUMBER**
1793	
MAIL DATE	**DELIVERY MODE**
03/16/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/538,414	COX ET AL.	
	Examiner	Art Unit	
	Vanessa Velasquez	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *26,28,29,33 and 36-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *26,28,29,33 and 36-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 6, 2009 has been entered.

Status of Claims

Claims 1-25, 27, 30-32, 34, and 35 are canceled. Independent claim 26 is amended. Claims 26, 28, 29, 33, and 36-50 are pending and presented for examination on the merits.

Status of Previous Rejections under 35 USC § 112

The previous rejection of claim 26 and all claims dependent therefrom is withdrawn in view of the amendments to the claim.

The previous rejection of claim 36 for depending on a canceled claim is withdrawn in view of the amendment to the claim.

Claim Rejections - 35 USC § 112, First Paragraph

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 26, and all claims dependent therefrom, are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Specifically, there is no support in the original disclosure for the following limitations of the casting step: "wherein the casting step includes pouring the molten alloy into a casting mold, and solidifying the molten alloy."

Claim Rejections - 35 USC § 112, Second Paragraph

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 33, 44, and 45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. There is insufficient antecedent basis for the claim limitation "the improvement heat treatment."

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 26, 33, 36-38, 44-46, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Genereux et al. (US 4,769,087) in view of *Glossary of*

Metallurgical and Metalworking Terms (Metals Handbook, ASM Handbooks Online; hereafter, "Metals Handbook").

Regarding claims 26, 36, 37, and 38, Genereux et al. teach a process of thermomechanically treating nickel base superalloy such that it is in a condition to be forged. The process includes the following steps: (1) Casting a superalloy material (col. 3, lines 62-66; col. 4, lines 24-25); (2) Hot isostatic pressing (HIP) (redensifying) the cast superalloy (col. 4, lines 24-27); and (3) Subjecting the superalloy to an overaging treatment at a slow cooling rate (col. 4, lines 46-49; col. 4, lines 54-57). The flowchart in FIG. 1 shows an overview of the process. The heat treated superalloy is strengthened (precipitation hardened) by the gamma prime precipitates, and may be used in the manufacture of turbine disks (components) (col. 1, lines 13-23).

With regard to the redensification step, Genereux et al. do not specify the duration between the casting and HIP. However, it would be obvious to one of ordinary skill in the art to carry out HIP immediately after casting because doing so would decrease manufacturing time and increase the efficiency of the process.

With regard to the overaging step, Genereux et al. provide an example wherein the superalloy is subjected to an overaging heat treatment after HIP (col. 6, lines 55-62). Furthermore, it appears that no cooling takes place between HIP and overaging because overaging occurs at 2170^{o}F, which is higher than the HIP temperature of 2165^{o}F (col. 6, lines 55-62). In order to maintain or increase the temperature between the HIP and overaging steps, the superalloy would be expected to remain in the same enclosure to prevent a drop in temperature. The reduction of the holding time for the

overaging step would, then, be a natural consequence of keeping the superalloy in the same enclosure. Coarsening of the gamma prime precipitates is expected to occur due to the slow cooling rates (col. 4, lines 54-57). After the overaging heat treatment, the superalloy is machined into a cylinder (col. 6, lines 58-63).

With regard to the cooling rate, Genereux et al. do not teach the claimed cooling rate. However, it is well held that discovering an optimum value of a result-effective variable involves only routine skill in the art (MPEP § 2144.05 Section II). In the instant case, the cooling rate is a result-effective variable because changing its value would have a direct effect on the size of the gamma prime precipitates (FIG. 2; col. 4, lines 64-68). Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the cooling rate of the overaging heat treatment to achieve a desired precipitate size.

With regard to the casting step, Genereux et al. do not describe the casting step in detail. However, the claimed steps of pouring molten metal into a mold and solidifying the molten metal constitute a convention widely accepted in the metallurgical arts, as evidenced by Metals Handbook. The second definition of casting in Metals Handbook is as follows: “Pouring molten metal into a mold to produce an object of desired shape” (p. 34 of 257). (Here, the term “shape” implies a solid body because liquefied masses cannot independently retain a shape.) Thus, it would have been obvious to one of ordinary skill in the art to perform the casting of Genereux et al. in the manner taught in Metals Handbook because it is, by very definition, how metal is cast.

Regarding claims 33 and 44, the superalloy is heated, for example, at 2170°F for four hours (a set temperature) and then slowly cooled (col. 6, lines 55-62).

Regarding claim 45, the overaging heat treatment occurs at a temperature between the solvus start and finish temperatures, which encompass a region that is sufficient to bring precipitates into solution (col. 4, lines 58-63; col. 2, lines 57-65).

Regarding claim 46, the solvus start and finish temperatures will depend on the specific alloy undergoing heat treatment, but the example alloy in Genereux et al. has a noneutectic solvus temperature of 2050-2185°F (1121-1196°C) (col. 3, lines 6-9), which overlaps the claimed temperature.

Regarding claim 50, HIP is conducted at 2165°F (col. 6, lines 57-58), which is below the 2185°F incipient melting temperature (solidus) of the alloy (col. 3, lines 12-14).

9. Claims 28, 29, 39, 43, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Genereux et al. (US 4,769,087) in view of *Glossary of Metallurgical and Metalworking Terms* (Metals Handbook, ASM Handbooks Online; hereafter, "Metals Handbook"), as applied to claim 26 above, and further in view of Vogt et al. (US 6,120,624).

Regarding claim 28, Genereux et al. do not teach implementing an additional heat treatment after the machining step.

U.S. Patent No. 6,120,624 issued to Vogt et al. is drawn to nickel base superalloys that are heat treated before welding to prevent cracking in the heat-affected

zone (HAZ). Vogt et al. additionally teach that it is common to heat treat a nickel base superalloy after welding to produce a desired set of mechanical properties within the superalloy (col. 4, lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art to have appended a subsequent heat treatment to the process of Genereux et al. for the purpose of achieving a desired set of mechanical properties.

Regarding claim 29, the post-weld heat treatment of Vogt et al. comprises heating the superalloy at a temperature above the gamma prime solvus temperature (col. 4, lines 14-19). (Note: 2120°F is above the solvus gamma prime solvus temperature – see Vogt et al., col. 3, lines 35-38). Heating above the solvus temperature forces the gamma prime phase to go into solution, thereby partially reversing the coarsening of the precipitates from any prior overaging heat treatments.

Regarding claim 47, the heat treatment following welding occurs at 2120°F, which is above the gamma prime solvus temperature (Vogt et al., col. 4, lines 15-21), and therefore, sufficient to bring the gamma prime phase into solution (Vogt et al., col. 3, lines 35-38).

Regarding claim 48, Vogt et al. are silent as to a specific cooling rate for the post-weld heat treatment. However, it is well held that discovering an optimum value of a result-effective variable involves only routine skill in the art (MPEP § 2144.05 Section II). In the instant case, cooling rate is a result-effective variable because it affects the extent that the gamma prime phase is precipitated in the gamma matrix (Vogt et al., col. 2, lines 8-10). Therefore, it would have been obvious to one of ordinary skill in the art to

have optimized the cooling rate to achieve a superalloy with a desired amount of gamma prime phase precipitates.

Regarding claims 39 and 43, Genereux et al. do not teach welding the nickel base superalloy using a filler with a similar composition of the base metal. Vogt et al. show that it is common for nickel base superalloys to be welded (entire document). With regard to the materials used in welding, Vogt et al. teach that the base material to be welded may comprise IN939 and that an acceptable choice of filler is Nimonic 263, which has a composition similar to IN939 (col. 4, lines 6-14). The use of similar materials as base and filler would ensure that the welded area has substantially similar mechanical properties as the rest of the base material, thereby ensuring uniformity of the performance of the material in-service. Therefore, it would have been obvious to one of ordinary skill in the art to weld the superalloy of Genereux et al. using a weld filler of a substantially similar composition, as taught by Vogt et al., in order to produce a welded structure that has substantially uniform properties throughout.

10. Claims 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Genereux et al. (US 4,769,087) in view of *Glossary of Metallurgical and Metalworking Terms* (Metals Handbook, ASM Handbooks Online; hereafter, "Metals Handbook"), as applied to claim 26 above, and further in view of Heitman et al. (US 5,071,059).

Regarding claim 40, Genereux et al. do not teach welding the nickel base superalloy using a filler with a composition that is identical to that of the base metal.

U.S. Patent No. 5,071,059 issued to Heitman et al. is drawn to welding single crystal nickel base superalloy turbine blades (abstract). Heitman et al. teach that the filler material is preferably identical in chemical composition to the alloy being welded (col. 3, lines 62-68). The use of the exact same material as base and filler would ensure that the welded area has mechanical properties that are identical to the rest of the base material, thereby ensuring uniformity of the performance of the material in-service. Therefore, it would have been obvious to one of ordinary skill in the art to weld the superalloy of Genereux et al. using a weld filler of the exact same composition, as taught by Heitman et al., in order to produce a welded structure that has uniform properties throughout.

Regarding claim 41, Heitman et al. teach that it is preferable for the weld filler to be of the same composition as the workpieces being welded (col. 3, lines 62-68). Thus, in the case that the workpieces are superalloys, the weld filler would also be a superalloy, and because superalloys are capable of being precipitation hardened, the weld filler material must also necessarily be capable of being precipitation hardened.

Regarding claim 49, Genereux et al. teach that gamma prime precipitates are a dominating factor affecting the strength of the superalloy to which they belong; hence, the desire to maximize their amount to a reasonable limit (col. 1, lines 22-26). Percentages may lie in the 40-70% by volume range (col. 1, lines 28-29). Thus, it would be obvious to one of ordinary skill in the art at the time of the invention to ensure that the precipitations in the weld filler amount to at least 35 vol.% because the presence of

a relatively large volume of precipitates would strengthen the joint at which the superalloy is welded.

11. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Genereux et al. (US 4,769,087) in view of *Glossary of Metallurgical and Metalworking Terms* (Metals Handbook, ASM Handbooks Online, as applied to claim 26 above, and further in view of Vogt et al. (US 6,120,624) and Watter (US 2,304,976).

Regarding claim 42, Genereux et al. do not teach welding the superalloy and then hammering the weld.

U.S. Patent No. 6,120,624 issued to Vogt et al. is drawn to nickel base superalloys that are heat treated before welding to prevent cracking in the heat-affected zone (HAZ). Vogt et al. demonstrate that welding superalloys is well known.

U.S. Patent No. 2,304,976 issued to Watter is drawn to a method of relieving stresses produced from welded sheets of material. Watter teaches that the stresses are relieved by peening (i.e., mechanical working of metal by hammer blows of shot impingement) the welded portions (page 2, lines 27-42). The air hammer of the peening apparatus is used to impart force to the weld (page 2, lines 43-51). Relieving the stresses caused by welding is important because the stresses cause undesirable distortions (waves, ripples) in the welded material (page 2, lines 10-26). Therefore, it would have been obvious to one of ordinary skill in the art to have hammered the welded superalloy of Genereux et al. in view of Vogt et al. for the purpose of relieving the stresses caused by the welding process.

Response to Arguments

Applicant's arguments have been considered but are moot in view of the new grounds of rejection.

The arguments with respect to the Lake reference are moot in view of the new grounds of rejection.

Regarding the arguments against Vogt et al. and its failure to teach the claimed cooling rate, MPEP § 2144.05 (Section II) makes it clear that "differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical." In the instant case, there is a difference in cooling rate between the claimed invention and the Vogt reference; however, this difference is not sufficient to patentably distinguish the claimed invention from the prior art. Furthermore, Applicant has not provided objective evidence demonstrating criticality of the claimed range to rebut the rejection.

Additionally, it is well held that discovering an optimum value of a result-effective variable involves only routine skill in the art (MPEP § 2144.05 Section II). In the instant case, cooling rate is a result-effective variable because it affects the extent that the gamma prime phase is precipitated in the gamma matrix (Vogt et al., col. 2, lines 8-10). Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the cooling rate to achieve a superalloy with a desired amount of gamma prime phase precipitates.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is 571-270-3587. The examiner can normally be reached on Monday-Friday 9:00 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
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/Vanessa Velasquez/
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